

We Claim:

1. A method for making particles from a liquid feed stock containing a pharmaceutical agent to produce particles suitable for pulmonary administration having a narrow particle size distribution comprising:
5 providing a feed stock comprising a pharmaceutically active agent and a solvent;
 forcing said feed stock into a manifold defined between a vibratable element and a plate and forcing the feed stock through the plate, said plate comprising holes of at least one
10 predetermined diameter, in order to produce droplets comprising a droplet size distribution wherein at least 80% of the droplets have a diameter within $\pm 25\%$ of the median droplet diameter;
 removing solvent from said droplets to produce particles suitable for pulmonary administration.
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2. A method according to claim 1 further comprising vibrating said vibratable element in order to force said feed stock through the plate and produce droplets.
3. A method according to claim 2 wherein a piezoelectric element is coupled to said
20 vibratable element.
4. A method according to claim 1 wherein said holes comprise a predetermined diameter of less than 30 microns.
- 25 5. A method according to claim 4 wherein said holes comprise a predetermined diameter of less than 10 microns.
6. A method according to claim 1 wherein said plate comprises holes having a first diameter of less than 30 microns and a second series of holes having a second diameter of $\pm 50\%$ of said
30 first diameter.
7. A method according to claim 6 wherein said second diameter is within $\pm 20\%$ of said first diameter.

8. A method according to claim 7 wherein said first diameter is less than 10 microns.
9. A method according to claim 1 wherein said atomizer is provided with said feed stock at a feed rate of 5 ml/mn - 3500 ml/mn.
10. A method according to claim 1 wherein said particles are porous.
11. A method according to claim 1 wherein said particles comprise a MMD of less than 10 microns and a MMAD of 1 - 5 microns.
12. A method according to claim 1 wherein said particles comprise a particle size distribution wherein at least 90% of the particles have a diameter within a range of less than 4 microns.
13. A method according to claim 1 wherein at least 90% of the droplets have a diameter within $\pm 25\%$ of the median droplet diameter.
14. A method according to claim 1 wherein at least 95% of the mass of the droplets have a diameter within $\pm 25\%$ of the median droplet diameter.
15. A method according to any one of claims 1, 13, or 14 wherein the droplets have a diameter is within $\pm 15\%$ of the median droplet diameter.
16. A method according to claim 15 wherein the droplets have a diameter within $\pm 8\%$ of the median droplet diameter.
17. A method according to claim 1 wherein said solvent is removed by heating said droplets in a gas stream to produce dried particles.
18. A method according to claim 17 wherein said dried particles are collected.
19. A method for spray drying a feed stock containing a pharmaceutical agent to produce particles suitable for pulmonary administration having a narrow particle size distribution comprising:

providing a feed stock comprising a pharmaceutically active agent at a flow rate of at least 5 ml/min;

forcing said feed stock into a manifold defined between a vibratable element and a plate and forcing the feed stock through the plate, said plate comprising holes of at least one

5 predetermined diameter, in order to produce droplets;

drying said droplets in a gas stream to produce dried particles comprising a particle size distribution wherein at least 70% of the mass of the particles have a diameter within a 4 micron range; and

collecting said dried particles.

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20. A method according to claim 19 wherein the dried particles comprise a particle size distribution wherein at least 80% of the mass of the particles have a diameter within a 4 micron range.

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21. A method according to claim 19 wherein the dried particles comprise a particle size distribution wherein at least 90% of the mass of the particles have a diameter within a 4 micron range.

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22. A method according to any one of claims 19-21 wherein the dried particles have a diameter within a 3 micron range.

23. A method according to any one of claims 19-21 wherein the dried particles have a diameter within a 1.5 micron range.

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24. A method according to claim 19 further comprising vibrating said vibratable element in order to force said feed stock through the plate and produce droplets.

25. A method according to claim 24 wherein said plate is vibrated by coupling a piezoelectric element to said plate.

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26. A method according to claim 19 wherein said holes comprise a predetermined diameter of less than 30 microns.

